

Application No. 10/700,136
Amendment filed with RCE

Customer No. 01933

Listing of Claims:

1. (Currently Amended) A semiconductor device comprising:
a semiconductor substrate having a plurality of connecting
pads on one surface;

an insulating film which is formed of a single layer and
5 covers said one surface of the semiconductor substrate, and which
includes: (i) a plurality of holes extending through the
insulating film, each of the holes corresponding to one of the
connecting pads, and (ii) at least one recess extending partially
through the insulating film such that a bottom surface of the
10 recess is depressed with respect to an upper surface of the
insulating film in a direction of thickness of the insulating
film, each said recess ~~extending from a first position at an edge
of one of said holes to a second position outside an area above
the connecting pad to which said one of the holes corresponds~~
15 including a first portion through which one of the holes extends
and which surrounds a periphery of the one of the holes and a
second portion which extends outwardly from the first portion;
and

at least one interconnection formed on the bottom surface of
20 a corresponding said at least one recess to extend along the
bottom surface, over the first portion and the second portion of
the recess, each said at least one interconnection being

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25 ~~connected~~ directly contacted to a corresponding one of the
connecting pads through a corresponding one of the holes in the
insulating film, and each said at least one interconnection being
formed of a same material along an entire length thereof.

Claim 2 (Canceled).

3. (Previously Presented) A device according to claim 1,
wherein each said recess in the insulating film has a pair of
side surfaces, and a space is provided between each said at least
one interconnection and the side surfaces of the recess in which
the interconnection is provided.

4. (Previously Presented) A device according to claim 1,
wherein the at least one interconnection comprises a connecting
pad portion, and

wherein the semiconductor device further comprises:

5 a bump electrode formed on the connecting pad
portion, and

an encapsulating film formed around the bump electrode
and on the insulating film and the at least one interconnection.

5. (Withdrawn) A device according to claim 4, further
comprising an upper insulating film formed between the insulating

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film and the encapsulating film, said upper insulating film having a hole formed in a portion corresponding to each said bump electrode.

6. (Withdrawn) A device according to claim 5, wherein the insulating film and upper insulating film are made of materials containing a same main component.

7. (Withdrawn) A device according to claim 5, wherein the upper insulating film and the encapsulating film are made of different materials.

8. (Withdrawn) A device according to claim 4, wherein each said bump electrode protrudes from an upper surface of the encapsulating film.

9. (Withdrawn) A device according to claim 4, wherein each said bump electrode comprises a lower bump electrode and an upper bump electrode formed on the lower bump electrode.

10. (Withdrawn) A device according to claim 9, wherein the lower bump electrode protrudes from an upper surface of the encapsulating film.

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11. (Withdrawn) A device according to claim 1, wherein the at least one interconnection comprises a connecting pad portion formed on the corresponding one of the connecting pads to which the interconnection is connected, and

5 wherein the semiconductor device further comprises:

at least one bump electrode formed on the connecting pad portion of the at least one interconnection, and

an encapsulating film formed around the bump electrode and on the insulating film.

12. (Original) A device according to claim 1, wherein the insulating film is made of an organic resin.

13. (Previously Presented) A device according to claim 1, wherein the recess in the insulating film has a depth which is not less than a thickness of the interconnection.

14. (Original) A device according to claim 1, wherein the insulating film has a thickness of 10 to 30 μm .

15. (Original) A device according to claim 1, wherein the recess has a depth of 5 to 15 μm .

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16. (Previously Presented) A device according to claim 15, wherein a distance between a bottom surface of the insulating film and the bottom surface of the recess is not less than 1 μm .

Claims 17-35 (Canceled).

36. (Previously Presented) A semiconductor device comprising:

a semiconductor substrate having a plurality of connecting pads on one surface;

5 an insulating film which covers said one surface of the semiconductor substrate, and which includes: (i) a plurality of holes extending through the insulating film, each of the holes corresponding to one of the connecting pads, and (ii) at least one recess extending partially through the insulating film such
10 that a bottom surface of the recess is depressed with respect to an upper surface of the insulating film in a direction of thickness of the insulating film, each said recess extending from a first position at an edge of one of said holes to a second position outside an area above the connecting pad to which said
15 one of the holes corresponds; and

at least one interconnection formed on the bottom surface of a corresponding said at least one recess to extend along the bottom surface, each said at least one interconnection being

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connected to a corresponding one of the connecting pads through a
20 corresponding one of the holes in the insulating film;

wherein each said recess in the insulating film has a pair
of side surfaces, and a space is provided between each said at
least one interconnection and the side surfaces of the recess in
which the interconnection is provided.

37. (Currently Amended) A semiconductor device comprising:
a semiconductor substrate having a plurality of connecting
pads on one surface;

a protective film formed of a single layer, said protective
5 film including: ~~(i)~~ (i) a plurality of holes extending completely
through the protective film, each of the holes corresponding to
one of the connecting pads, and (ii) a plurality of recesses
extending partially through the protective film, each of said
recesses having a recessed surface that is lower than an upper
10 surface of the protective film in a thickness direction of the
protective film, and each of said recesses extending from a first
position at an edge of one of said holes to a second position
outside an area above the connecting pad to which said one of the
holes corresponds; and

15 interconnections which are respectively connected to the
connecting pads through the holes in the protective film, and

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which are provided on the recessed surfaces of the protective film to extend along the recessed surfaces;

20 wherein each of the recesses in the protective film has a pair of side surfaces, and a space is provided between each of the interconnections and the side surfaces of the recess in which the interconnection is provided.

38. (New) A device according to claim 36, wherein the insulating film is formed of a single layer.

39. (New) A device according to claim 36, wherein the at least one interconnection comprises a connecting pad portion, and wherein the semiconductor device further comprises:

5 a bump electrode formed on the connecting pad portion, and

an encapsulating film formed around the bump electrode and on the insulating film and the at least one interconnection.

40. (New) A device according to claim 39, further comprising an upper insulating film formed between the insulating film and the encapsulating film, said upper insulating film having a hole formed in a portion corresponding to each said bump electrode.

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41. (New) A device according to claim 40, wherein the insulating film and upper insulating film are made of materials containing a same main component.

42. (New) A device according to claim 40, wherein the upper insulating film and the encapsulating film are made of different materials.

43. (New) A device according to claim 39, wherein each said bump electrode protrudes from an upper surface of the encapsulating film.

44. (New) A device according to claim 39, wherein each said bump electrode comprises a lower bump electrode and an upper bump electrode formed on the lower bump electrode.

45. (New) A device according to claim 44, wherein the lower bump electrode protrudes from an upper surface of the encapsulating film.

46. (New) A device according to claim 36, wherein the at least one interconnection comprises a connecting pad portion formed on the corresponding one of the connecting pads to which the interconnection is connected, and

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- 5 wherein the semiconductor device further comprises:
- at least one bump electrode formed on the connecting
pad portion of the at least one interconnection, and
- an encapsulating film formed around the bump electrode
and on the insulating film.

47. (New) A device according to claim 36, wherein the
insulating film is made of an organic resin.

48. (New) A device according to claim 1, wherein the recess
in the insulating film has a depth which is not less than a
thickness of the interconnection.

49. (New) A device according to claim 36, wherein the
insulating film has a thickness of 10 to 30 μm .

50. (New) A device according to claim 36, wherein the
recess has a depth of 5 to 15 μm .

51. (New) A device according to claim 15, wherein a
distance between a bottom surface of the insulating film and the
bottom surface of the recess is not less than 1 μm .

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52. (New) A semiconductor device comprising:

a semiconductor substrate having a plurality of connecting pads on one surface;

a protective film formed of a single layer, said protective film including: (i) a plurality of holes extending completely through the protective film, each of the holes corresponding to one of the connecting pads, and (ii) a plurality of recesses extending partially through the protective film, each of said recesses having a recessed surface that is lower than an upper surface of the protective film in a thickness direction of the protective film, and each of said recesses including a first portion through which one of the holes extends and which surrounds a periphery of the one of the holes and a second portion which extends outwardly from the first portion; and

a plurality of interconnections which are respectively directly connected to the connecting pads through the holes in the protective film, and which are provided on the recessed surfaces of the protective film to extend along the recessed surfaces over the first and second portions of the recessed surfaces, and each of which is formed of a same material along an entire length thereof.

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53. (New) A device according to claim 1, wherein the at least one interconnection comprises a lower layer and an upper layer formed on an entire upper surface of the lower layer so as not to laterally extend from the upper surface of the lower layer.